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UNIVERSITY OF CALIFORNIA
Institute of Transportation Studies
Technology Transfer Program

Tech Transfer

Technology Transfer for Local Transportation Agencies

IN THIS ISSUE:

Coping with Congestion

Coping with Congestion

Simulation models are being used to preview how various options will affect corridorwide traffic flow.

By Phyllis Orrick

When traffic on very congested freeways spills over onto local streets, it creates trouble for Caltrans, local agencies, and drivers. Solving this kind of corridorwide problem is difficult. It can involve choosing between constructing new lanes, which is costly, and the less certain strategy of installing advanced traffic management strategies to enable the existing roadway to carry more vehicles.

To help engineers and planners improve their ability to analyze the traffic impacts of different proposed solutions, the University of California Institute of Transportation Studies, with support from Caltrans, has developed a series of hands-on training courses to introduce three highly regarded off-the-shelf simulation models: CORSIM, FREQ, and INTEGRATION. These courses were offered for the first time last spring to 30 Caltrans district staff and will be given in spring 1999, with enrollment open to anyone. (See p. 15 for course descriptions.)

Evaluating ITS Strategies

Les Jones, Chief of the Office of Travel Forecasting and Analysis at the California Department of Transportation, says the ability to model operational changes intended to solve capacity or overflow problems is essential. New simulation models in particular can provide important information on the effects of regional strategies, such as congestion pricing to modify demand, as well as the relief provided by adding new lanes, new HOV lanes, and ramp meters. The results of the model run can help decision makers understand the most effective (and efficient) approaches towards relieving congestion within a corridor.

The need for improved project-level models is not new. Caltrans has been funding research and training on freeway and traffic models since the 1960s, when the FREQ

(Continued on page 12)

ERRATUM

If you thought congestion in California was bad based on the statistics in our cover story last quarter, we apologize. Congestion is bad, but not *that* bad. The number of registered vehicles and the vehicle miles traveled were mistakenly reversed. Registered vehicles grew from 12 million to 22 million, and vehicle miles traveled grew from 117 million to 276 million between 1970 and 1995!

Tech Transfer
Technology Transfer for Local Transportation Agencies

Technology Transfer Program (TTP) is a unit of the Institute of Transportation Studies at the University of California, Berkeley. Its mission is to support the development and implementation of advanced transportation systems by facilitating exchanges of information between research and practice and by providing a program of professional training and technical assistance in the areas of traffic operation; infrastructure maintenance; transportation planning and management; airport operations, planning and management; and traffic safety.

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Field Engineers provide peer-to-peer technical assistance to local transportation agencies. Four field engineers serve specific geographic areas in California. Larry Santucci can be consulted on asphalt paving questions by public agencies statewide. Call a field engineer when you need advice or help with a technical problem.

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Letter from the Editor

By Donna Reid

Elections have just finished as I write this and as you read it we will be on our way into the first month of 1999, the last year of the decade and the century. Many changes loom, not only in transportation but also in our society at large. Two of these changes are reflected in our main feature articles on corridor analysis modeling software and on welfare to work. In a way, these two very different themes get to the essence of the changes we are seeing: new tools, old problems. One deals with the application of rapidly advancing computer technologies to solve the old problem of traffic congestion on the roads. The other explores how some transportation agencies use a combination of common sense and high tech to deal with that other old societal problem, helping those who have difficulty providing for themselves.

We also have a report on an important safety program underway with the Automobile Club on traffic safety for children. And as we are looking towards the future, have a look at some of the trends our futurist brought to our attention at our 50th Annual Symposium on Transportation Practice held in Sacramento in October. He says we are into our 50th year of the information technology revolution, meaning we have another 20 years to go for the tools and methodologies brought by this revolution to become manifest. We will also have new problems to confront.

Closer to home, a new program funded by the Office of Traffic Safety will provide free traffic safety evaluations to communities in California. ITS will serve northern California, and San Diego State will serve the southern part of the state. We're also developing new training opportunities in advanced signals, planning and the environment.

At Tech Transfer we are committed to presenting news on the successful tools and methods that will help you in your job managing our transportation system.

Feel free to drop me a line if you have any questions or comments. I would love to hear from our readers.

HAPPY NEW YEAR!

The Future Is Informative

David Pearce Snyder closes the 50th Transportation Symposium with a look ahead

Your e-mail fills up with messages, your phone machine fills up with messages, your mail box is stuffed to the gills, and your in-box lies buried like sunken treasure. Relax, the information age is just beginning to hit its stride! At our 50th Symposium on Transportation Practice, futurist David Pearce Snyder outlined the 70-year cycle for a technology revolution. According to Snyder, we're three quarters through the cycle. It's time to brace yourself; the productivity increases that have been predicted are beginning to take off.

Field Engineers (l. to r.) Les Jorgensen, Dave Royer, Larry Santucci, Don Raffaelli, and Scotty Bruce, with Natalie Fay, LTAP Program Manager.

How are the changes to come going to impact transportation agencies? Some of the trends discussed were analyzed by participants using an "impact wheel," a simple tool to facilitate group discussion of first, second, and third level impacts of a well-recognized trend. Some of the trends explored follow.

Business as usual?

• an increase in e-commerce reducing paper mail 50 percent by 2015

• 25 percent of retail shopping done by mail, phone, or Internet by 2010

• as wages rise the number of jobs per household will fall

• one-third of employment will be home-based by 2015

• 15 percent of the work force will be telecommuting by 2015

Home Sweet Home

• more of the population will move to rural areas while many middle-income and aging households will move back into inner cities spurring mixed-use development in the urban core

• aging suburbanites and new urban immigrants will foster paratransit innovations including small electric cars for local travel

The Goods on Shipping

• shippers and freight carriers will adopt standardized modular containers to automate handling

• air freight will double by 2010

• growth of e-commerce will emphasize surface goods movement.

Overall, Snyder suggested that a reduction in commuters caused by population shifts and employment trends will be offset by an increase in freight movement as a more affluent, aging population consumes goods and services via the Internet. The little electric cars may have major impacts on traffic engineering in residential and smaller commercial neighborhoods. Will your agency be ready?

Photographs by Don Steiger

At the Rural Track Session: Susan Ker, LTAP Program Manager, and Tom Flinn, Deputy Director, San Joaquin County Department of Public Works.

Other sessions at the symposium focused on building public support, advanced technologies, TMCs, travel corridors, long-life asphalt, innovative funding for small agencies, emergency response, new freight technology, pavement testing, traffic engineering in small communities, impacts of SB 45, non-standard solutions and risks, the new Bay Bridge plan, and pavement management. The new rural issues track was markedly successful.

Attendees were warmly welcomed to the symposium by such luminaries as James van Loben Sels, Director of Caltrans; Jeff Lindley of the Federal Highway Administration; Mayor of Sacramento Joe Serna Jr., and ITS Acting Director Martin Wachs. All provided a reaffirmation of the work being done in transportation and a boost of inspiration for the audience. Attendees later enjoyed a buffet reception.

This year also offered the first-ever poster session. Innovative solutions to street design and airport planning were showcased. The symposium also offered two well-attended, informative pre-conference workshops on Traffic Calming and Integrated Project Financing.

Welfare to Work

New partnerships emerge between transportation and social service agencies

By Donna Reid

Welfare reform – the rallying cry of both state and federal administrations – has sent social service agencies looking for effective mechanisms to ensure reduction of the welfare rolls, in California a huge 50 percent by 2002. Section 10531 of the California Welfare and Institutions Code (WIC) requires each county to develop a plan, consistent with state and federal requirements, describing the full range of transportation services available to move CalWORKS clients from welfare to work. At the same time, transit operators are coping with TEA-21's cut in operating subsidies. They need riders and new sources of funding. When social service agencies come seeking expertise from transportation professionals to build cost efficient and effective programs; the scene is set for innovative partnerships and new arrangements.

Ventura's Comprehensive Plan

According to Ginger Gherardi, Executive Director of the Ventura County Transportation Commission (VCTC), county representatives took the lead by soliciting the commission's input on a task force to address welfare to work issues in the spring of 1998. The task force included representatives from private industry, schools and colleges, as well as public agencies. Their discussions resulted in development of a set of complementary projects having different lead agencies. VCTC led development of the funding proposal to the Department of Labor.

A major problem turned out to be the spatial mismatch between the residential location of welfare clients, most of whom lived in Oxnard, and the location of entry-level jobs in Thousand Oaks and Simi Valley. Without cars, the trip looked impossible. The commission found that by changing a few transit routes, modifying schedules to expand hours somewhat, and adding Saturday service, workers could take the bus to off-peak shifts at employers in outlying suburbs. This modification, in turn, became an opportunity to promote bus-pass coordination among several local transit agencies, including expansion of a smart card project begun in 1994 as a federally funded demonstration project.

> Coordination between transit operators goes to the heart of making public transit work.

The smart card project involves use of prepaid debit cards by riders. A card costs $5 to obtain and can have funds allocated to it in increments of ten dollars. It contains a small computer chip that deducts the cost of the ride for the rider. Since different riders pay different amounts for their rides on fixed route and dial-a-ride systems, getting agreement about how to allocate revenues from a cross-agency trip has been difficult. But, says Gherardi, "Coordination between transit operators goes to the heart of making public transit work." And, in fact, though it is difficult to sort out the variables, Ventura County has seen a 19 percent increase in ridership this past year, while its fare recovery ratios this year have far exceeded the state requirement. Gherardi credits much of this success to projects associated with the welfare to work initiative.

Used Cars for Job Seekers

Meanwhile, since transit rarely solves all transportation problems, the county supervisors have established a program to provide job seekers with used cars. Dubbed the Job Opportunity Transportation Program, this project identifies surplus economy vehicles in public and private fleets and facilitates their purchase by new workers through low-cost guaranteed loans from the county. Loans also cover the costs of registration, insurance, and smog tests. Inspections and repairs are carried out at minimal expense by community college auto repair classes.

Help with Carpooling

The Oxnard Job to Career Center, another task force member, took the lead in creating Ridestar On-Line Access (ROLA), which is a database containing more than half a million riders interested in car- and vanpooling. The database also contains transit information and so enhances transit ridership. People access the system through the Employment Development Department for reasons of confidentiality. ROLA has been popular with both newly transitioned workers and social service agents, according to Alan Holmes of the Southern California Association of Governments (SCAG).

Finally, to encourage carpooling, which some studies have shown to be a particularly effective mode of transportation for welfare-to-work-ers, VCTC set up a guaranteed ride home program. This service provides free ride vouchers to those who carpool or vanpool to work as well as to those in job training programs. Participants must enroll in the program through VCTC and must be signed up at least one week before they use the service. Participants are limited to two uses per month. The program should provide transportation when a carpooler is called home for an illness, a child-care problem, or other family crisis, when a supervisor asks for overtime, or when an employee is stranded at work because the car-/vanpool driver is not available. Vouchers can be used for taxis, when the commute is less than 20 miles, or to pay for a rental car. Funding for the program comes from the DOL grant to the county social service agency. Rides home average $25, and currently the program has 4,900 people enrolled. The VCTC does not, however, operate vanpools.

Know Your Partners

The key to developing a set of complementary transportation programs is coordina-

tion, and coordination doesn't always come easily. In San Luis Obispo, planners at the Council of Governments (SLOCOG) were finding it hard to get local transportation and social service agencies to work together to accommodate the transportation needs of those moving from welfare to work.

Information projects seem to produce the greatest bang for the buck.

So, to set a positive tone and establish a foundation for broad-based future collaborations, Dan Herron of SLOCOG helped orchestrate a retreat in April 1997. Agencies at the retreat included the Regional Transportation Authority (RTA), the Department of Social Services, Drug and Alcohol Enforcement, the Economic Development Department, the Economic Opportunity Commission, the Private Industry Council (PIC), Cal Poly, Cuesta College, SLO Transit, Goodwill Industrial, and SLO Personnel (a job placement agency). The retreat built confidence as well as communications, according to Herron. Many of the agencies in attendance had never worked together before and quickly found that their working assumptions about transportation needs and mechanisms were not at all the same.

The group formed a number of subcommittees to address different aspects of the welfare to work problem, such as education, child care, and employment as well as transportation. Each subcommittee identified lead agencies for projects and agency-based champions. Their work proved productive, and within seven months of start-up SLOCOG made and received a special federal grant of $20,000 from FTA to develop and plan mobility models. Although the amount was small, the prestige that came with the grant was high: SLOCOG was one of only five such grantees in the U.S.

A first step in developing their mobility plan was to do a GIS analysis of the transportation system options. This helped the partners visualize various transportation options as well as the locations of welfare recipients and facilities for childcare, job training, and work. With this information they started to identify projects. Working together the group now has a list of 20 ways to assist welfare recipients with their transportation needs. According to Herron, information projects seem to dominate the list, primarily because they could get the greatest bang for the buck. One of the first projects to be completed is the new Transit Guide, which cost just $3,500 to develop and print one thousand copies. Other projects on the list include a trip planning database, training for local CalWORKS staff, establishment of a guaranteed ride home program, a universal transit pass, car loans, and an auto repair program. To speed implementation, each project is assigned to a lead agency. A member of the committee from the lead agency then agrees to champion the project by putting it into the next agency workplan.

For more information call: Ginger Gherardi, Executive Director, VCTC, at 805-642-1591, ext. 208; or Dan Herron, Transportation Planner, SLOCOG, 805-781-5711; or visit their Web sites. (See Surf City, p. 11.)

Suggestions for Further Reading

Mark A. Hughes with Julie E. Sternberg. 1992. *The New Metropolitan Reality: Where the Rubber Meets the Road in Anti-Poverty Policy.* Public Finance and Housing Center, The Urban Institute, Washington DC.

John Pucher, et al. 1998. "Socioeconomics of Urban Travel: Evidence from the 1995 NPTS." *Transportation Quarterly*. Vol. 52, No. 3 (Summer): 15-33.

UC-Sponsored Traffic Safety Evaluations for California Communities Are Back

By David Rompf

The Institute of Transportation Studies Technology Transfer Program is launching a new technical assistance project to help northern California cities and counties improve local traffic safety. It is supported with funds from the California Office of Traffic Safety (OTS) and replaces the 25-year-old Enforcement and Engineering Safety Evaluation (E & E) program administered by UC since the early 80s. The new project doesn't require communities to be evaluated, but it retains the strengths that made E&E popular, while adding elements to ensure the broad dissemination of best practices.

Dr. Ted Chira-Chavala, Associate Research Engineer at the Institute of Transportation Studies at Berkeley and organizer of the annual Traffic Safety Forums held on the campus, will function as the lead expert for the project. Dr. Chavala will be assisted by teams of professionals from the engineering and enforcement communities who will conduct on-site evaluations of safety programs and conditions.

OTS is also funding a counterpart program based at San Diego State University to serve southern California. Contact information for both can be found at the end of this article.

In October we interviewed Dr. Chavala about the new project.

TT: Berkeley is starting a new traffic safety evaluation program this year – what is its mission and how will the program work?
TCC: This is not a brand new undertaking. The Northern California Traffic Safety Evaluation Program funded by OTS is actually based on a long-running project of the ITS Technology Transfer Program to provide technical assistance in traffic safety improvements to cities and communities in California. The new program aims to do more to assist communities to improve traffic safety.

The mission of this program is multi-fold. It will provide community-specific technical assistance to help identify contributing factors to safety problems and develop effective strategies to counteract them. This will be accomplished by a team of two individuals; one will be an expert in traffic engineering, while the other will specialize in enforcement issues. They will study background information on the region's safety problems and conditions. Then they will visit the community to see firsthand what these conditions are. Cooperation between these expert consultants and the community's safety stakeholders will help to ensure the success of this visit. Then our team will prepare a brief technical report that will analyze the specific safety problems and offer recommendations for approaches to enhance safety conditions.


Ted Chira-Chavala

We will prepare best practices documents on potential countermeasures that all communities can consider using to improve local traffic safety. These documents will provide information about the potential effectiveness of suggested solutions and provide real world examples, drawn from throughout California.

As part of the program, UC Berkeley will also organize a special workshop each year for cities and counties throughout the state. The primary purpose of this workshop will be to develop the expertise of local safety practitioners. It will also provide opportunities for networking.

UC Berkeley will serve as a resource on traffic safety on specific safety issues. For example the ITS Tech Transfer newsletter will regularly feature articles on traffic safety measures.

Finally, we want to help communities connect with one another and with safety professionals and experts nationwide, and we can use the University's vast network of safety researchers, advocates, and agencies serving virtually all safety-related disciplines. This kind of cross-disciplinary approach is particularly useful for formulating, implementing, and monitoring a safety improvement plan.

Assistance with any of these components may be requested directly from the ITS Technology Transfer Program, by phone or in writing. In addition, UC Berkeley researchers, in collaboration with OTS, will identify communities that can benefit from this technical assistance on an ongoing basis and invite their participation.

TT: In traffic engineering and enforcement, what do you think are the most urgent safety issues in California?
TCC: Typically, a local safety issue that needs attention has elements that are both specific to the locality and common among many localities. Examples of the former elements include: the need to minimize traffic conflicts among road users at a known high-crash location in order to create a safer environment for a specific type of road user; controlling vehicle speeds that are excessive for a prevailing condition; or designing a roadway and its surrounding environment to be more "forgiving" of some particular kind of road user error. Examples of the latter include: the need to keep impaired road users off the road; enforcing traffic laws with an eye to reducing high crash rates among teen drivers; or protecting "vulnerable" road users such as children, the elderly, and the disabled from traffic hazards. These are just a few.

TT: How can a "best practice" for traffic safety be adopted?
TCC: For example, a city wishes to improve safety for elderly pedestrians. The best prac-

tice guidelines would provide information about various potential countermeasures such as traffic control, geometric improvements, lighting, enforcement, education, and use of advance technologies that are associated with improved safety for this group. As the user reviews this information she will match the specific local problem with measures found to be effective elsewhere and see the potential benefits.

TT: What kinds of traffic safety expertise exist at UC Berkeley that can be called on for this project?
TCC: UC Berkeley's expertise in traffic safety cuts across several disciplines. Transportation safety is a program component of the multidisciplinary Institute of Transportation Studies (ITS). In fact the emphasis on transportation safety work is growing within the Institute. The UC Berkeley School of Public Health emphasizes injury prevention as well as the behavioral and epidemiological aspects of traffic safety. The California PATH program (a research unit within ITS) is investigating applications of advanced technologies for traffic safety improvements. Both the School of City and Regional Planning and the University of California Transportation Center (UCTC) specialize in the study of planning and policy relevant to transportation safety. The School of Optometry does research on human factors; for example, night vision and color blindness, as these relate to improvements in the design of road and traffic infrastructure. This is not an exhaustive list of traffic safety-related expertise that we have on the Berkeley campus.

TT: How does a community find information, technical assistance, and funds for traffic safety?
TCC: Any community working to improve local traffic safety should take comfort in knowing many other communities have faced this difficult task. Information about resources, assistance, and funding is out there but not always easy to find. Usually one gets good information from another community which has made a similar effort through conversations with colleagues. This can lead to the discussion of technical details of planning efforts. Also there are numerous traffic safety conferences as well as our own UCB-ITS Tech Transfer courses. As far as funding resources are concerned, California has many state agencies such as OTS, Caltrans, and the Department of Health Services which can provide assistance directly. Federal agencies such as NHTSA, FHWA, and the CDC may assist a community with a particular project. In addition, private organizations such as AAA and Mothers Against Drunk Driving (MADD) may be able to provide "contributions-in-kind" such as safety materials, information, personnel, and tools.

This is why having UC Berkeley as an initial, "one-stop" resource for northern California can be very advantageous. We already have established working relationships with many of the agencies, groups, and individuals concerned about traffic safety. Therefore, we can help match a community with specific resources in order to advance its plans for developing a safer traffic environment.

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Road Markings: New Uses, New Technologies

A bibliography compiled by Catherine Cortelyou of the Harmer E. Davis Transportation Library, Institute of Transportation Studies

For these materials, write to Interlibrary Lending, ITS Library, 412 McLaughlin Hall, University of California, Berkeley, CA 94720-1720; telephone us at (510) 642-3604; send a fax to (510) 642-9180 or e-mail us at itslib@uclink4.Berkeley.edu.

Use of Pavement Markings to Reduce Rear-End Conflicts at Commercial Driveway Locations

By Richard A. Retting, Michael A. Greene, and Joy Van Houten. In *Research on Traffic Control Devices*. Washington, DC: Transportation Research Board, 1997, pp.106-110.

To explore the possibility of reducing rear-end collisions precipitated by vehicles slowing to turn into high-traffic commercial driveways, the Insurance Institute for Highway Safety conducted a test of pavement markings designed to prompt drivers of through vehicles to watch for turning vehicles in the same lane. The pavement markings used were the standard right-turn and through-lane arrow markings which conventionally are installed before intersections to alert drivers to lane-specific designated vehicle movements. The markings in the study were installed several hundred feet in advance of four busy midblock suburban commercial driveways, and potential conflicts between turning and through vehicles were measured before and after installation. Conflicts were reduced at three sites, but increased at the one site with unusual geometry. The study concludes that pavement markings, even if moderately effective, can be quite cost-effective because of their relatively low cost and long service life.

Use of Pavement Markings to Reduce Excessive Traffic Speeds on Hazardous Curves

By Richard A. Retting and Charles M. Farmer. In *ITE Journal*, Vol. 68, No. 9, September 1998, pp. 30-34.

This study, also sponsored by the Insurance Institute for Highway Safety, aimed at finding a means to make curves safer. Currently 40 percent of fatal roadside crashes occur on curves. An experiment was conducted at a single location on a suburban two-lane secondary road, which includes a sharp left curve preceded by a long tangent section; speed advisory signs were already in place. A pavement marking consisting of two 18-inch wide white lines across the road framing the word "SLOW" and an eight-foot-high left curve arrow was installed approximately 220 feet before the curve. A before/after design with control was employed. A six percent overall reduction in vehicle speed was noted, and the percent of vehicles exceeding 40 mph dropped by more than half. A discussion of other appropriate traffic engineering measures for accident reduction on curves is also included.

Pavement Marking Materials: Assessing Environment-Friendly Performance

By Anthony L. Andrady. Washington, DC: Transportation Research Board, 1997. 60 p. (National Cooperative Highway Research Program Report 392)

This report was compiled in anticipation of the Environmental Protection Agency's limitation of volatile organic compounds (VOC) in traffic marking coatings to 150 g/L (1.26 lb./gal.) this past fall [63 FR48848, 48886, Sept. 11, 1998, as corrected at 63 FR 55175, Oct. 14, 1998]. A process for measuring the engineering performance, environmental performance, and possible health impacts of various classes of conventional marking materials used for traffic markings is described to help state DOTs faced with evaluating their road marking materials. Of wider interest in this report are background materials on pavement marking material performance, types of pavement markings, and toxicity issues, as well as the research leading to the EPA regulation.

A Preliminary Field Evaluation of Ultraviolet-Activated Fluorescent Roadway Delineation

By Karen R. Mahach, et al. In *Public Roads*, Vol. 61, No. 1, July-August 1997, pp.2-7.

A new lane-marking technology uses fluorescent road markings that create a full-light effect when hit by UV from headlights. This technology not only works well under conditions of poor visibility but also does not blind oncoming drivers. Both static and dynamic tests were conducted. In the various tests, visibility increased 19 to 47 percent, and improvement was also found in detection of pedestrians. The path of the roadway could be seen far beyond oncoming vehicles. This article describes the test procedures and the very encouraging findings. In the words of one test subject, "That's very cool."

Meeting the Low VOC Traffic Paint Challenge

By Doug Pierce. Paper presented at the 1997 Annual Meeting of the Transportation Research Board. 21p.

Anticipating the reduction in volatile organic compounds in traffic paints, the Washington State Department of Transportation tested the effectiveness of waterborne and a low-VOC acetone-based paint. Retroreflectivity was the standard for comparison. Results of the waterborne paint test were positive for all parameters except cost, and preliminary indications for cost were very positive. Moreover, it appeared that the waterborne paint could exceed the performance of the solvent paint then in use by the state. If less wet millage of waterborne paint could be applied to obtain the same result, then the costs for the new paint might prove to be less than the solvent paint. Preliminary tests indicate that its performance will be equal to or better than WSDOT's toluene-based paint. Tables of detailed findings are included in the paper.

Traffic Safety Education Pays Off

CSAA's "Otto the Auto" comes alive

By Ted Chira-Chavala

Nearly 300 children under 13 years old are killed, and another 27,000 injured in traffic crashes each year in California. Pedestrians and bicyclists account for about 50% and 30% of these injuries, respectively. One traffic safety education program aimed at enhancing the safety of child pedestrians and bicyclists is the "Otto the Auto" Program.

The AAA Foundation for Traffic Safety began producing filmstrips starring a cartoon character called "Otto the Auto" in 1957. In 1991, under the auspices of the California State Automobile Association (CSAA), the character became Otto, the remote-controlled, electronic talking car. In a 20-minute group presentation, Otto and a facilitator engage children ages 3 to 8 in a dialogue on passenger, pedestrian, and bicycle safety. Otto meets 40,000 children in over 200 schools each year. CSAA also launched a new Otto Club Web site (www.ottoclub.org) in October 1997.

Researchers at the UC Berkeley Institute of Transportation Studies have studied the impacts of the Otto program on young children from 10 schools in Northern California. The study focused on improvement in children's traffic safety knowledge, attitude, ability to select safe situations on the road, and behaviors. A total of 530 children from kindergarten through second grade were interviewed one month before and two months after the Otto presentation.

Principal Findings

The Otto presentation was associated with the following changes in the children's attitudes:

• among the younger children, a 20 percent increase in those with correct knowledge about the importance of looking in all directions (including behind) for cars before crossing a street;

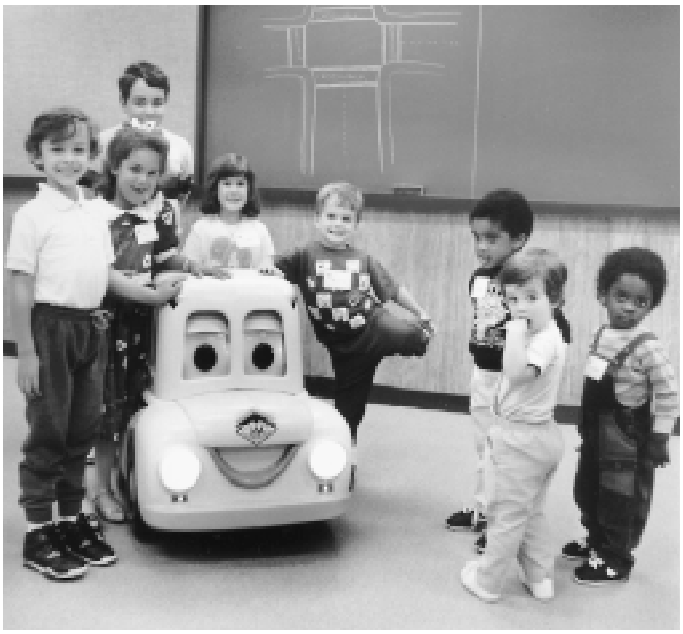
• a nearly 20 percent increase in the number of children who knew that a seat belt was properly buckled by hearing a "click" sound;

• an 11 percent increase in the number of children using crosswalks;

• a nearly 10 percent increase in the number of children with correct knowledge that bright colors were safe clothing colors for pedestrians in rainy weather;

• an 8 percent increase in the number of children who would ask an adult to go into the street to help retrieve a ball or toy, as opposed to going into the street themselves. Age had some influence on this attitude; and

• a 7 percent increase in the number of children with knowledge that it was unsafe to play in driveways.



"Otto the Auto" talks traffic with school children.

The Otto presentation did not have a significant impact

• on enhancing children's awareness that it is safer to walk against the direction of traffic in a street with no sidewalks, but that bicycles should be ridden in the same direction as the traffic. In fact, most children were somewhat confused about these two pieces of apparently contradictory advice; and

• on increasing helmet ownership among the 14 percent of the children who did not own bicycle helmets at the time of the presentation.

The research also revealed that over half of the children did not know that they should always stop and look in all directions before riding their bicycles into a street from a driveway or minor street. "Ride-out" is a contributing factor to about 60 percent of collisions between motorists and child bicyclists.

Even before attending the Otto program, most children always wore seat belts when riding in cars, wore their bicycle helmets when riding bicycles (if they owned helmets), and did not play in the streets.

The study suggested that to be effective, traffic safety information given to young children must be simple, brief, and contain no conditional clauses or material that could be misconstrued as conflicting advice. Further, there is evidence to suggest that about 40 percent of the children forgot what they had learned in about two months.

The researchers recommended that teachers and parents be provided with materials for follow-up sessions with children to reinforce and clarify the actual lessons.

For more information see "Impacts of Child Traffic Safety Education: CSAA's Otto-the-Auto Program" by T. Chira-Chavala and Douglas Cooper, 1998. A copy of this report may be obtained from the ITS library.

ITS Training Calendar

To register for one of the courses below call UC Berkeley Extension Registration at (510) 642-4111. For a catalogue or more details on courses, call (510) 231-9590, or visit our Web site at www.its.berkeley.edu/techtransfer. Course EDP numbers, dates, locations, and fees are listed below. Fees are two-tiered, with a subsidized rate for public agencies provided with funds from the Cooperative Training Assistance Program (CTAP).

INFRASTRUCTURE DESIGN AND MAINTENANCE

Asphalt Pavement Fundamentals: Design, Construction and Rehabilitation

Richmond	Feb. 23-25	EDP486183	$300/$450

Asphalt Pavement Maintenance

Stockton	Feb. 25	EDP486266	$65/$150
Pismo Beach	March 10	EDP486241	$65/$150
Emeryville	March 23	EDP486274	$65/$150

What's New in Asphalt Paving

Modesto	March 3	EDP486258	$65/$150
Riverside	June 2	EDP485110	$65/$150

Fundamentals of Geometric Design

Burbank	July 22-23	EDP485151	$125/$295

Automated Landslide Warning System

San Francisco	Feb. 18-19	EDP486191	$125/$295
Riverside	May 12-13	EDP486217	$125/$295

Rockfall Hazard Mitigation

Truckee	June 17	EDP486233	$65/$150

Fundamentals of Applied Open Channel Flows and the HEC-RAS Program

Sacramento	June 21-23	EDP485177	$175/$395

Introducing HEC-RAS Version 2.1

Sacramento	June 24-25	EDP485185	$125/$295

TRAFFIC ENGINEERING AND SIGNALIZATION

Fundamentals of Traffic Engineering

Ontario	June 7-11	EDP485169	$250/$525

Traffic Signal Design

Santa Ana	Feb. 23-25	EDP486118	$175/$395

SYNCHRO: A Tool for Traffic Signal Timing Analysis and Optimization

Sacramento	Feb. 2	EDP486167	$65/$150
Riverside	Feb. 4	EDP486175	$65/$150
Irvine	Feb. 5	EDP48633	$65/$150

Fundamentals of Roadway Lighting

Sacramento	May 19-20	EDP486134	$125/$295

Traffic Calming

Richmond	May 12	EDP486225	$65/$150

PROJECT DEVELOPMENT AND MANAGEMENT

Introduction to Inspection Practice

Ontario	May 20-21	EDP486316	$125/$295
Emeryville	June 17-18	EDP485136	$125/$295

Legal Liability Issues in Transportation

San Francisco	Feb. 24-25	EDP486282	$125/$295

Project Engineer/Project Manager Training

San Diego	March 8-10	EDP486308	$175/$395
Stockton	May 3-5	EDP486324	$175/$395

Update: The Highway Capacity Manual

Yuba City	April 28-30	EDP486290	$175/$395
Ventura	July 26-28	EDP485128	$175/$395

PLANNING AND POLICY

Coordinating Transportation and Land Use

Brea	March 17-19	EDP486209	$175/$395

Introduction to Traffic Simulation Models

Richmond	Feb. 3	EDP486340	$65/$150

Understanding and Using INTEGRATION 2.1 *

Richmond	Feb. 24-26	EDP496133	$270/$450

Understanding and Using CORSIM *

Richmond	Mar 31-April 2	EDP496125	$270/$450

Understanding and Using FREQ12 *

Richmond	April 21-23	EDP496117	$270/$450

**Caltrans employees should coordinate enrollment in these lab courses through Les Jones, Program Chief, Office of Travel Forecasting at Caltrans. He has special funding for this training and can be reached at Calnet 4643330.*

W2W Surf City

http://www.ctaa.org/welfare/ CTAA has a number of pages devoted to welfare-to-work including "Access to Jobs" program in TEA-21, a report on the first national conference on employment transportation (Nov. 96), "People, Jobs and Transportation," and "A Guide to Innovative Practices in Welfare-to-Work Transportation."

http://www.fta.dot.gov/wtw/japc.html FTA has information on the Job Access & Reverse Commute Program including a fact sheet, legislative language, keys to success, transportation resources for employers, and questions for public outreach.

http://www.goventura.org/ The Ventura County Transportation Commission describes its programs. (See story in this issue.)

http://www.welfareinfo.org/transita.htm April Kaplan of the Welfare Information Network provides an overview of Transportation and Welfare reform describing the background, policy issues, research findings, innovative practices, initiatives, works in progress, and links to other resources.

http://www.dot.ca.gov/hq/MassTrans/wtwplan.htm Caltrans makes available its "Public Transportation Guide for Assistance in Implementing County CalWORKS Plans," which provides specific links between the transportation and social services agendas. Also provided is a worksheet for the Transportation Services Inventory Form and a list of MPO and RTPA contacts who coordinate efforts in California.

http://www.sppsr.ucla.edu/its/conference/program.htm UCLA hosted a conference in March 1998, "Getting Welfare Recipients to Work: Transportation and Welfare Reform," to highlight research on the relationship between transportation access and employment.

www.slonet.org/~ipslocog San Luis Obispo has developed a model program in welfare to work. Read their draft "Welfare Reform Mobility Study" here. (See story in this issue.)

www.rideshare.org/ See San Luis Obispo's Rideshare program in action.

http://www.fhwa.dot.gov/tea21/factsheets/jobaccs.htm FHWA provides a program description for the "Access to Jobs" program, including funding features, grant award criteria, and definitions.

http://www.fhwa.dot.gov/reports/challeng.htm "The Challenge of Job Access: Moving Towards a Solution" describes how transportation agencies can identify needs, develop strategies, and meet the challenge. STOP

ERRATUM: Last issue's Web site on the Integrated Transportation Management Center at TTI no longer exists (sorry!).

Field Engineer's Corner

Small and Rural Agencies Meet the Challenge of Limited Resources

By Don Raffaelli

Although I thought I was very familiar with issues that affected rural and/or small public works agencies, I have been impressed by the creative ways that the smallest agencies are dealing with constrained resources.

In most of the small cities, the "staff" consists of three to twelve employees who are responsible for water systems, sewer systems, streets, parks, animal control, building inspection and public building maintenance. Counties perform most of the same functions along with responsibilities for airports, harbors, cemeteries, boating facilities and traffic signals.

One way small agencies meet this cross-functional demand is for adjacent jurisdictions to develop cooperative agreements to share personnel and equipment for specific tasks. Partnering is relatively common in emergency situations, but can reap substantial rewards when practiced regularly. For example, all agencies need crack sealing equipment, pavement grinders, ventilating equipment, shoring devices, paving machines and boom equipment. Since small agencies can't use large specialized equipment 365 days a year, it can be shared. When equipment is shared, the owner agency needs to maintain and repair the equipment and provide operators with the proper training.

In Humboldt County, for example, the sign shop had an informal agreement to provide signs to Caltrans, the Cities of Trinidad and Ferndale, the California Department of Parks and Recreation, and the Bureau of Land Management. Humboldt County provided the labor and skill to make the signs while the partners purchased the materials, including enough for Humboldt County's needs.

Another solution is to share the services of an outside contractor. Small agencies can piggyback their procurements with Caltrans and other larger agencies for equipment, materials, and traffic signal systems. Contracting out specialized tasks can maximize resources, but doing this requires advance planning and a cooperative attitude by both agencies and their respective legislative bodies. Partnering arrangements are usually informal and made on a handshake.

The Tech Transfer Field Engineers are available to answer questions and visit your jurisdiction to serve as a soundingboard and source of information and advice based on our experiences and knowledge. Please don't hesitate to use us! STOP

SIMULATION MODELS

(Continued from the cover)

simulation model was developed by UC Berkeley's Professor Adolf May. FREQ is now in its 12th version — an enhanced Windows version with easier-to-read color graphics — thanks in large part to encouragement from the participants in last spring's course on FREQ.

The development of the new series of training courses on simulation models for corridorwide analysis began with a worldwide survey of available software led by Alexander Skabardonis, a research engineer at UC Berkeley's Institute of Transportation Studies. Researchers evaluated their findings against a set of user-based criteria (for example, ease of data entry and validation routines and ability to deal with HOV lanes, ramp meters, and coordinated signals as well as more traditional operational improvements). The training series — by and large taught by the experts who developed the software — focuses on those simulation models deemed most likely to provide practical solutions for engineers and planners wanting to analyze individual projects. To encourage Caltrans staff to use what they were learning to analyze real district projects, ITS course instructors also provided follow-up technical assistance.

A description of the experiences of some district-level users follows:

Visualizing Options with CORSIM

In District 10 (Stockton), Caltrans transportation engineer Jim Ecclestone is using CORSIM to analyze ways to handle increasing westbound freeway traffic on the Altamont Pass, a 15-mile stretch of I-205 and I-580 with seven interchanges and up to four lanes in each direction linking Stockton, Tracy, and the East Bay. "The a.m. commute today is not that bad," Ecclestone says, now that I-205 westbound is being widened where it joins I-580. "But by the year 2010, you'll have 5,900 [vehicles per hour] westbound from east of Tracy." That number could rise to 8,000 at the pass itself. By 2020, traffic volumes on the same four-lane segment at the pass could hit 10,000 vehicles per hour.

> CORSIM was able to demonstrate that the four or five easiest fixes wouldn't work.

The Tri-Valley Transportation Commission is hoping to accommodate the additional traffic volume without constructing more lanes. Caltrans is using CORSIM to explore alternatives. "It's kind of a tall order," Ecclestone says. He hasn't yet come up with any solutions, but he has at least been able to demonstrate that the four or five easiest fixes won't work. With CORSIM he can both do the analysis and generate pictures of the likely effects of increased traffic, which can be shown at public meetings. "Showing people a picture helps a lot," says Ecclestone. "That's probably CORSIM's strongest point — as a selling tool," he says.

Gene Murtey, the Traffic Projections and System Planning Coordinator for Caltrans District 2 (Redding), agrees that CORSIM's detailed animations are especially useful for communicating options to lay audiences. He is using CORSIM to model signals and turn lanes for about 10 intersections along a stretch of Route 36 through Susanville and show local agency representatives the effects of various improvements on the roadway network. CORSIM also accepts data from MINUTP, a traditional travel demand model Murtey uses.

A graphical interface program that works in conjunction with CORSIM's simplifies the job of building the network, which Murtey notes is one of the hardest input tasks in corridor analysis. Instead of having to key in site coordinates or lines of code to place elements on the network, the operator can just point and click to insert an element into a location.

Using FREQ to Find Bottlenecks

Since different models have different strengths, Murtey also plans to use FREQ to model long-term congestion trends on a 30-mile stretch of I-5. This section has roughly 16 interchanges and runs from Tehama County to Shasta Lake. Like CORSIM, FREQ can incorporate data from MINUTP, including growth rate projections based on historical data. FREQ can identify specific bottlenecks where increases in congestion are most likely to require action at some later date.

In Caltrans District 6 (Fresno), associate transportation engineer Sharri Bender-Ehlert is modeling ramp meters on a six-mile-long, six-lane section of Route 41, using CORSIM for her in-house analysis and FREQ through an outside consultant.

> If we want to take the analysis to a city council or some other governing body, it's better to show them a little movie rather than a pile of output paper.

The freeway is the main north-south commute route for Fresno. "Our big concern is future growth to the north of Fresno feeding into our corridor, which already has congestion," she says. "The peak is 6,600 to 6,800 [vehicles per hour] at our bottleneck location, which is at capacity now," she says, but demand on the ramps is even higher. Queues on the ramps and the mainline can extend a couple of miles.

With ramp meters at five of the seven interchanges and HOV bypass lanes, the segment would appear to be a natural for FREQ analysis. This is why Bender-Ehlert hired a consultant to run FREQ to analyze impacts of a large development proposed to the north in Madera County. At the same time, she chose to run CORSIM for the in-house analysis, because, she said, CORSIM's graphical representation of the results is so realistic and easy to understand. "You get a movie, so to speak, a car by car model,

whereas FREQ gives you a numerical printout. If we want to take the analysis to a city council or some other governing body, it's better to show them a little movie rather than a pile of output paper," she says. Because she has experience using FREQ, she will use its results to check the accuracy of CORSIM's output.

Matching Models with Problems

District 3's Office of Travel Forecasting and Modeling spearheads the modeling effort for the Caltrans northern region, which covers the Marysville, Eureka, and Redding districts. They run both CORSIM and FREQ, but apply them to distinctly different situations. CORSIM is being used to analyze rural corridors on about a dozen different projects, while FREQ is being applied to two sections of urban freeway in the greater Sacramento area.

In Truckee, engineers used the model results to design longer turn lanes before any dirt was moved.

Doug MacIvor, Chief of District 3's Office of Travel Forecasting and Modeling, is responsible for modeling a total of 30 miles of rural freeway corridors with CORSIM, including the bypasses for Route 101 in Willits (District 1) and I-80 in Truckee as well as a project on Route 28. They involve modeling turn lanes, signalization options, and, for two of the projects, effects of freeway improvements on the local street network.

When MacIvor's office analyzed the design of the proposed Truckee bypass last year, "we noticed the left-hand and right-hand turn pockets weren't long enough," he says. Since construction hadn't yet begun, engineers could use the model results to design longer turn lanes before any dirt was moved.

(Continued on page 14)

SIMULATION MODELS: SOME BACKGROUND

Generally, simulation models run on one of three scales: macro-scopic, meso-scopic, and micro-scopic. Historically, modelers performed macro-scopic analysis, meaning the analyses were based on average speeds, flows, and densities of traffic. Specificity of analysis was sacrificed for gains in computer speed, which made it possible to analyze much larger areas over much longer periods of time. As computing power grew, modelers moved towards meso-scopic analysis. At this mid-scale level, individual vehicle paths could be modeled, but other factors such as speed were still averaged. Today, computer processing speeds and memory capacities have grown to the extent that true micro-scopic modeling is now feasible on the desktop. As a result, today's models allow the analyst to look at many factors affecting traffic at an individual level and to perform this analysis over large interrelated networks involving freeways, surface streets, and multiple signalized intersections.

In 1997, ITS researchers surveyed the universe of traffic simulation models for engineers and planners. They were seeking off-the-shelf products that were available for public use, well-documented, and that had a record of practical application in real life. They also looked for models that could be fairly quickly installed and used in a desktop environment. Technical criteria for selection included the ability to accurately represent real-life traffic flows in corridors and relative ease of data input, calibration, and validation. Three off-the-shelf models met most of the above criteria: CORSIM, FREQ, and INTEGRATION.

FREQ, developed by Professor Adolf May at Berkeley in the late 1960s under Caltrans sponsorship, has a well-proven ability to model large-scale freeway operations over lengthy periods of time for the effects of ramp metering and HOV lanes. It is also useful to measure the effects of more complex strategies, such as congestion pricing to reduce demand, on equally large scales. FREQ12, which will be completed by spring 1999, provides several enhancements in a Windows environment, making this piece of software quite user friendly, and an effective choice for simulating impacts of some of the more common "advanced" freeway control strategies.

CORSIM (CORridor SIMulation), developed for the Federal Highway Administration, is widely used. It is a fully micro-scopic model, including algorithms for car-following, lane-changing, and queue discharge. The model combines features of the earlier FRESIM (FREeway SIMulation) and NETSIM (NETwork SIMulation) models to permit analysis of traffic impacts along a freeway and its adjoining surface street network. It is particularly useful for modeling complex signalization projects and freeway interchange systems. Strengths include detailed modeling of traffic operations under over-saturated and incident situations. It models both pre-timed and actuated signal controllers that are isolated or coordinated, as well as local ramp meters. Realistic screen animation has made CORSIM particularly useful for helping non-technical persons understand the meaning of analytic results.

INTEGRATION was developed in 1985 by Michael Van Aerde of Virginia Polytechnic Institute and is continuously being refined and enhanced. The model simulates combined freeway and arterial networks experiencing time-varying demand, capacity, and control. It is the only off-the-shelf model that simulates and assigns individual vehicles to the network, so it can model motorist information systems and route guidance systems. It can also model dynamic traffic management strategies such as ramp metering and both isolated and coordinated signals. INTEGRATION is a fully micro-scopic model, with algorithms for car following, lane changing, and gap acceptance. STOP

SIMULATION MODELS

(Continued from page 13)

On the Route 101 project, which is also still several years away from construction, CORSIM is being used to examine design choices as well as the impacts of construction schedules on local traffic, so the district can anticipate problems and take corrective action.

CORSIM Makes Choices Easier

As have others, MacIvor finds CORSIM a particularly useful tool for exploring options with local officials and the public. CORSIM was run to show what would happen if Route 28 were narrowed from four lanes to three lanes over a couple of miles of roadway in the Kings Beach area of Tahoe. The idea behind the proposal was to encourage motorists to patronize local businesses by slowing down traffic and making the area more pedestrian friendly. However, the model run indicated that traffic would back up farther than expected, possibly blocking the fire station. "We had a meeting with the North Tahoe business association, and of the 44 people at the meeting, 40 initially favored the narrower roadway. After we finished the presentation using CORSIM, 40 people favored the wider option," MacIvor says.

> Even the most sophisticated corridor analysis tool can be distorted if the assumptions underlying data inputs are unknown or inconsistent.

FREQ, on the other hand, is an effective tool for analyzing options to improve flows on urban freeways. In District 3 these focus on the north-south I-5 corridor and two related east-west segments of I-80, all in the area of Sacramento. FREQ has been used to model ramp meters and HOV lanes. John Holzhauser is lead traffic engineer for the ramp metering work. Based on the FREQ results for I-5, he recommended adding 11 new ramp meters during the morning peak and 12 during the evening. Holzhauser also looked at the effects of ramp metering projects on two sections of I-80, totaling roughly 16 miles. The results of the FREQ analysis suggested installation of 20 new meters over 13 interchanges. FREQ was also used by the district's HOV unit to analyze HOV lanes on I-80 as well as State Routes 50 and 99.

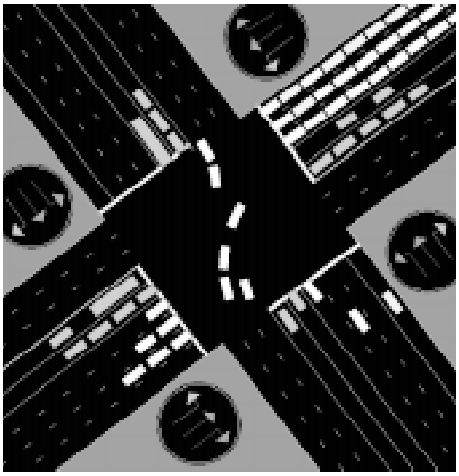


Image courtesy of Dowling Associates

A simulation of a CORSIM model.

INTEGRATION Gives a Big Picture

The third corridorwide simulation model taught in the ITS-Caltrans course is INTEGRATION. Still a fairly new program, it boasts the ability to do a large-scale simulation which can handle traffic assignments, route choice, and diversion. Utah DOT engaged SAIC's transportation group (formerly Transcore) in a major project to use INTEGRATION on the reconstruction of I-15 in Salt Lake City to address the need for traffic control measures related to the 2002 Olympics. Prior to that, FREQ was used to model the entire Salt Lake City freeway system during the morning and afternoon inbound rush in connection with evaluating ramp controls. As a result of the FREQ analysis, ramp controls were imposed on I-15 north- and southbound. Both model projects were felt to be successful, according to Loren Bloomberg of SAIC's transportation group. However, he says that adoption of INTEGRATION by local agencies may be slowed down by several factors. Since it is a very complex model, it requires a lot of expertise to use. The amount of data required is large, and the program reassigns traffic dynamically. Ongoing refinements continue, however, which will make it easier to use.

PARAMICS, produced in Scotland, has recently entered the scene and is receiving some attention. Its unique features include improved graphics and an ability to show 3-D renderings of vehicles, including views from inside the driver's windshield. PARAMICS will be used at the UC Irvine - District 12 test bed to explore a variety of new dynamic operations and management strategies.

Data Quality Key to Success

Caltrans engineer Tom Persons, however, who is in charge of writing Caltrans' *Traffic Impact Study Guide*, cautions that the output from even the most sophisticated corridor analysis tool can be distorted if the assumptions underlying data inputs are unknown or inconsistent. Corridor analysis in particular involves use of data derived from disparate sources, since travel corridors are by nature cross-jurisdictional in scope. Combining sets of data that don't work well together or are inconsistent can affect output results tremendously. This is why, he notes, it is critical for all agencies within a corridor to understand what the models can do and to reach agreement on how data will be collected and used. With this kind of agreement, he says, "we'll go a long way with simulation models." STOP

UC Berkeley Institute of Transportation Studies
Technology Transfer Program

A series of four workshops on the latest software: Spring 1999

This new series provides hands-on training with the best off-the-shelf simulation software for analyzing traffic operations in freeway-local arterial corridors. The instructional team is led by UC Berkeley Associate Researcher Alexander Skabardonis and the software developers. Students may register for the entire series to develop expertise in current state-of-the practice, or for one course. The courses on particular software packages are taught in the computer lab and are hands-on. Registration will be limited.

Fees for employees of California's public agencies will be partially remitted with funds from the Cooperative Training Assistance Program (CTAP). Caltrans staff should coordinate enrollment with Les Jones, Chief Officer, Travel Forecasting and Analysis, email: <Les_Jones@dot.ca.gov>.

Introduction to Traffic Simulation Models

Wednesday, Feb. 3, 1999

Instructors: Alexander Skabardonis, UC Berkeley & Rick Dowling, Dowling Associates
Fees: $150, $65 CA public agencies

This course introduces simulation and provides practical comparative information on the benefits, limitations and costs of currently available off-the-shelf modeling software versus traditional analytical methods. Examines existing state-of-the-art products, including CORSIM, FREQ, INTEGRATION, and PARAMICS. Scenarios range from analyzing impacts of conventional operations improvements to deployments of advanced technologies. Discussion of data, staff, and training requirements is included along with a look at what's on the horizon.

This course is intended for managers of planning and engineering staff as well as technicians who will be taking one or more of the lab courses.

Understanding and Using INTEGRATION

Wednesday, Feb. 24 - Friday, Feb. 26, 1999

Instructor: Michael van Aerde, Virginia Tech University
Fees: $450, $270 CA public agencies

INTEGRATION is a freeway corridor analysis tool specifically designed to evaluate advanced traffic management and information systems through analysis of individual vehicles, patterns and dynamic traffic assignment. Lectures cover model theory, data requirements and interpretation of results. Labs focus on applications including control scenarios (for example, ramp metering, signal control) and traveler information technologies such as changeable message signs and route information or guidance systems.

Understanding and Using CORSIM

Wednesday, March 31 - Friday, April 2, 1999

Instructors: Alexander Skabardonis, UC Berkeley & Rick Dowling, Dowling Associates
Fees: $450, $270 CA public agencies

The CORSIM (CORridor SIMulation) model, developed by the FHWA, combines the FRESIM model for freeways analysis with the popular TRAF-NETSIM model used for surface street traffic analysis. Lectures discuss model theory, data requirements, calibration, and interpretation of results. Labs focus on applications involving isolated signalized intersections, arterial streets, grid networks, freeway sections, and corridors.

Understanding and Using FREQ12

Wednesday, April 21 - Friday, April 23, 1999

Instructors: Adolf May and Lannon Leiman, UC Berkeley
Fees: $450, $270 CA public agencies

FREQ is the most widely used model for the analysis of freeway operations. This examines the latest version, which is a Windows version, which analyzes up to fifty miles of freeway and includes model enhancements as well as improved on-screen displays. Lectures cover model theory, data requirements, calibration, and interpretation. In intensive, hands-on lab sessions, students can look at many different problems over extended periods of time and extended distances due to the speed with which FREQ can execute model runs. Labs focus on applications involving design improvements, ramp meter controls, and HOV lanes.

For more information, call (510) 231-5675 or visit our Web Site at <www.its.berkeley.edu/techtransfer>.

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